

REMARKS

By this Amendment, claims 1-2 and 6-7 are cancelled, and claims 8-14 are added. Thus, claims 8-14 are active in the application. Reexamination and reconsideration of the application are respectfully requested.

In the September 9, 2005 Amendment and in the January 26, 2006 Amendment, the Applicants have repeatedly requested the Examiner to supply the Applicants with a corrected Office Action Summary form (Form PTOL-326) of the Office Action Summary form attached to the previous Office Action dated June 9, 2005. In particular, the Applicants note that item 1 on this Office Action Summary form indicated that the June 9, 2005 Office Action was “responsive to communication(s) filed on 18 April 2003.” However, the June 9, 2005 Office Action was responsive to the filing of the present application on September 24, 2003. Furthermore, the Applicants note that item 3 under the “Attachment(s)” header indicated that a copy of the “4-18-03” Information Disclosure Statement (IDS) was returned to the Applicants. However, the IDS filed in the present application was filed on September 24, 2003, not on April 18, 2003.

Accordingly, the Applicants again respectfully request the Examiner to supply the Applicants with a corrected Office Action Summary form of the June 9, 2005 Office Action indicating that the June 9, 2005 Office Action was responsive to the communication filed on September 24, 2003 and that a copy of the September 24, 2003 IDS was returned to the Applicants.

On page 2 of the Office Action, claims 1-2 and 6-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jairazhboy et al. (U.S. 5,685,475) in view of Iwana (JP 55-16726) and further in view of Matsugi (JP 1-289566). This rejection is believed to be moot in view of the cancellation of claims 1-2 and 6-7.

Furthermore, the Applicants respectfully submit that this rejection is inapplicable to new claims 8-14 for the following reasons.

New claim 8 is directed to an apparatus for mounting an electronic component onto a board through a lead-free solder material by means of a flow soldering process while transferring the board.

New claim 8 recites the apparatus as comprising a conditioning chamber located downstream of the solder material supplying chamber in a transferring direction of the

board, sized to enclose the board therein, and containing an atmosphere for conditioning the board such that the lead-free solder material adhering to the board is in a completely molten condition.

As noted in paragraph [0035] of the specification, the term “chamber” means a structural member which defines a space, and the term “atmosphere” means a gaseous atmosphere in the space formed by the chamber. The fact that the conditioning chamber is sized to enclose the board therein can be understood from the present specification, e.g. “locating the board in a conditioning zone” in paragraph [0026] and “the board is located in the conditioning zone 8 by transferring it... to the conditioning chamber 18” in paragraph [0062].

According to the above-described conditioning chamber as recited in new claim 8, the lead-free solder material adhering to the board is put in a thermally uniform condition in the conditioning chamber between the solder material supplying chamber and the cooling chamber. This suppresses variation in the initial temperature at which the solder material starts to solidify in the cooling chamber, and thereby suppresses variation in a period required for the solidification of the solder material. As a result, the occurrence ratio of lift-off is decreased. (See paragraph [0028] in the specification.) It should be noted that the lift-off is a problem specific to the lead-free solder material. (See paragraphs [0012]-[0015] in the specification.)

Jairazbhoy et al. discloses that a board is heated prior to passing through a wave of solder to minimize thermal shock by reducing a period of application of heat, and that it is desirable to lower a temperature of the board after soldering. According to Jairazbhoy et al., an apparatus is provided with a pre-heating chamber, a soldering chamber (i.e. solder material supplying chamber) and a post-cooling chamber. However, Jairazbhoy et al. does not disclose, suggest, or even contemplate the conditioning chamber between the solder material supplying chamber and the cooling chamber as recited in claim 8.

The Examiner applied Iwana in an attempt to teach the feature of the conditioning chamber of the present invention. Iwana discloses that an article 6 is subjected to post-heating by an infrared ray lamp 3 and a reflecting plate 4 immediately after soldering. Specifically, the article 6 is irradiated by infrared rays where solder tends to be separated

from the article 6 as shown in Fig. 1. Since the purpose of Iwana is to avoid solder bridge and burr, it would be necessary to locally heat the article 6 at a position where the solder separates from the article 6, in order to cut the solder in a state having an optimum viscosity.

Accordingly, Iwana discloses that the infrared ray lamp 3 and the reflecting plate 4 are located in the solder material supplying chamber (see “Constitution” describing that the infrared ray lamp 3 having the reflecting plate 6 is turned ON when the article 6 to be soldered is passed over the solder in the solder tank 5 in order to post-heat the article 6 immediately after soldering the article 6 to prevent the temperature of the soldered article 6 from being lowered. It is clear that the infrared lamp 3 and the reflecting plate 4 in the apparatus of Iwana is markedly different from the conditioning chamber recited in new claim 8, which is sized to enclose the board therein, which contains the atmosphere for conditioning the board and which is located downstream of the solder material supplying chamber in a transferring direction of the board.

Therefore, Iwana clearly does not disclose or suggest the conditioning chamber as recited in new claim 8. Furthermore, one skilled in the art would not have contemplated the conditioning chamber from the disclosure of Iwana.

Further, those skilled in the art would be bound by the purpose of avoiding solder bridge and burr as taught by Iwana to modify the infrared ray lamp 3 and the reflecting plate 4. Thus, those skilled in the art having read the disclosure of Iwana would not try to replace the infrared ray lamp 3 and the reflecting plate 4 with the conditioning chamber of new claim 8 since the conditioning chamber of new claim 8 does not coincide with the purpose of avoiding solder bridge and burr.

Furthermore, if the conditioning chamber recited in claim 8 were applied to the apparatus of Iwana in place of the infrared ray lamp 3 and the reflecting plate 4, the article 6 would not be heated locally but entirely by the atmosphere in the conditioning chamber distant from the position where the solder separate from the article 6, and therefore, the solder could not be cut at that position with the optimum viscosity.

Matsugi, which was newly applied by the Examiner with respect to the feature of liquid cooling in the Office Action, also does not disclose, suggest, or even contemplate the conditioning chamber as recited in new claim 8.

Accordingly, Jairazhboy et al., Iwana and Matsugi each fail to disclose or suggest the conditioning chamber as recited in new claim 8.

Therefore, the Applicants respectfully submit that no obvious combination of Jairazhboy et al., Iwana and Matsugi would result in the invention new claim 8 since Jairazhboy et al., Iwana and Matsugi, either individually or in combination, clearly fail to disclose or suggest each and every limitation of new claim 8.

Furthermore, no obvious combination of Jairazhboy et al., Iwana and Matsugi is able to achieve the advantageous effects of the present invention of solving the problem of the lift-off phenomenon, which is a problem specific to lead-free solder material. Consequently, one skilled in the art would not have been motivated to modify Jairazhboy et al., Iwana and Matsugi in such a manner as to result in, or otherwise render obvious, the invention of new claim 8.

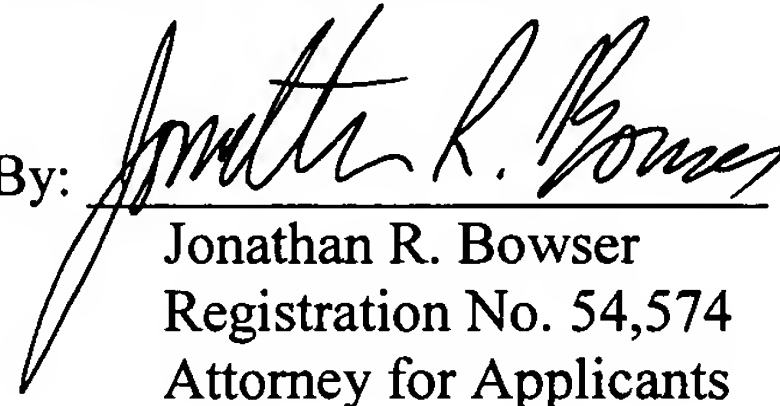
Therefore, new claim 8, as well as new claims 9-14, are clearly patentable over Jairazhboy et al., Iwana and Matsugi.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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